

Introduction to the Philosophy of Science

Rutgers University 01:730:225
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Mike Deigan

mike.deigan@rutgers.edu

<https://mikedeigan.com/teaching/225>

Description

The success of science and its impact on our lives and worldviews is astounding. To see this, compare the ways we live and think to the ways people living 50, 500, or 5,000 years ago lived and thought, and note how many of the differences can be traced to scientific advances. It is unsurprising, then, that science and its success raise a host of interesting and important philosophical issues. This course is an introduction to some of those issues.

The first part of the course will be about the metaphysics of science, including questions about what laws of nature are, whether scientific taxonomies correspond to real divisions in nature, and whether all of the sciences reduce to physics. The second part of the course will be about scientific methodology, including questions about how science makes progress and what roles values play in science.

The course type is “By Arrangement” and so has no single set meeting time, but it will still be primarily discussion-based rather than lecture-based. Each week you will meet on Zoom with a small group of your classmates, and most of the other assignments are designed to ensure that everyone is well prepared for these conversations. The aim is to help you think through the questions of the course together and to develop the important skill of having focused discussions that are both critical and collaborative.

Prerequisites

There are no prerequisites for this course.

Office Hours

I will be in the class Zoom room at preannounced times each week for discussions with whoever wants to drop by.

I enjoy talking with people about philosophy, so please feel welcome to come to these, even if you don't have any specific thing you feel you need to ask me about. You don't need to schedule a meeting to come to these.

If you need to meet with me one-on-one, you can either email me to find some time that works for us both, or you can schedule an appointment online for for some time on Tuesdays from (9:30–11:30) here: <http://mikedeigan.com/meet>

One-on-one meetings will need to be scheduled at least a day in advance.

Assignments

1. *Readings & Perusal Discussion*: there will be readings assigned for each week, typically around 30 pages (I will also post brief videos giving some background

and orientation). You will be required to read these carefully and discuss them on Perusall, an online social annotation platform accessed through Canvas.

2. *Group Meeting Participation*: at the beginning of the semester, you will be assigned to a group that will meet weekly over Zoom to discuss one or two issues related to the week's topic. You are required to attend and participate in these meetings. I will join your group for about half of them.
3. *Pre-meet Write-ups*: prior to each meeting, you will write a question you would like answered and a point you would like to make in the meeting. These will be shared with your group to help make a meeting agenda.
4. *Post-meet Write-ups*: after each meeting, you will write a brief report of the group discussion and what you've taken away from it.
5. *Argument Stress Tests*: over the course of the semester you will write two 1,000 word papers putting pressure on the weakest point in a philosophical argument and determining how best to strengthen the argument.

Grading

Perusall discussion:	25%
Pre-meet write-ups:	10%
Post-meet reports:	20%
Meeting participation:	20%
Argument Stress Test #1:	10%
Argument Stress Test #2:	15%

Each week your meeting participation and pre-meet write-ups will be graded for completion, and your Perusall participation and post-meet reports will be be graded on the following scale:

Excellent:	100 points
Good:	90 points
Acceptable:	80 points
Unacceptable:	60 points

One lowest grade in each category will be dropped, and your final grade for each will be the average of the rest. Argument Stress Tests will receive grades on a 100 point scale.

Rubrics for each assignment type will be distributed in advance.

Books

I will post all the readings on the course webpage; no book purchases required.

Policies

Late Policy:

For papers and post-meet reports, I'll take off two points for each day after the deadline it is turned in. No late credit for Perusall or pre-meet write-ups.

For all deadlines, I'm willing to be reasonably flexible. If you need an extra couple days because of other commitments or illness, just let me know a few days in advance and I don't mind giving an extension, even for non-emergency situations. If you need a longer extension or a last minute extension, then there needs to be some special and unforeseeable circumstance justifying it.

Schedule

The assigned readings are subject to change. I will notify you of any such changes at least one week in advance and post an updated syllabus on the course webpage.

Posited Entities: Realism & Instrumentalism

- Week 1 01/19 Selections from Osiander, Mach, Poincaré, Heisenberg
 Selections from Aristotle, Planck, Bell
 Putnam (1975) "What is Mathematical Truth?" (selection)
 Poincaré (1912) "The Relations Between Matter and Ether" (selection)
- Week 2 01/25 Laudan (1981) "A Confutation of Convergent Realism" (selection)
 Worrall (1989) "Structural Realism: The Best of Both Worlds?" Global,
 and Scientific" (selection)

Law Governed Universe?

- Week 3 02/01 Galileo (1623) *The Assayer* (selection)
 Wigner (1960) "On the Unreasonable Effectiveness of Mathematics in
 the Natural Sciences"
 Putnam (1975) "What is Mathematical Truth?" (another selection)
 Maddy (2007) *Second Philosophy* (selection)
- Week 4 02/08 Boyle (1647) "Of the Excellency and Grounds of the Corpuscular or
 Mechanical Philosophy" (selection)
 Roberts (2008) *The Law Governed Universe* (selection)
 Armstrong (1983) *What is a Law of Nature?* (selection)
 Beebe (2000) "The Non-governing Conception of Laws of Nature"
 (selection)

Natural Kinds and the Unity of Science

- Week 5 02/15 Franklin-Hall (2015) "Natural Kinds as Categorical Bottlenecks" (selection)
Root (2000) "How We Divide the World"
- Week 6 02/22 Descartes (1647) *Principles of Philosophy* (selection)
Putnam and Oppenheim (1958) "Unity of Science as a Working Hypothesis" (selection)
Fodor (1974) "Special Sciences (Or: The Disunity of Science as a Working Hypothesis)" (selection)
Kincaid (1990) "Molecular Biology and the Unity of Science" (selection)
- Week 7 03/01 Paper week, no reading assigned
03/06 **Argument Stress Test #1 due!**

How Does Science Make Progress?

- Week 8 03/08 Newton (1726) *Principia* (selection)
Hume (1748) *Enquiry Concerning Human Understanding* (selection)
03/15 Spring Break!
- Week 9 03/22 Popper (1963) "Conjectures and Refutations" (selection)
Feynman (1965) *The Character of Physical Law* (video selection)
Duhem (1906) "Physical Theory and Experiment" (selection)
- Week 10 03/29 Kuhn (1962) *The Structure of Scientific Revolutions* (selections)
- Week 11 04/05 Lakatos (1970) "Falsification and the Methodology of Scientific Research Programs" (selection)
Lipton (1990) "Prediction and Prejudice"
Brush (1994) "Dynamics of Theory Change: The Role of Predictions"

Values in Science

- Week 12 04/12 Kitcher (1993) "The Division of Cognitive Labor" (selections)
Strevens (2003) "The Role of the Priority Rule in Science" (selections)
Heesen (2018) "Why the reward structure of science makes reproducibility problems inevitable" (selections)
- Week 13 04/19 Douglas (2007) "Rejecting the Ideal of Value-free Science"
Longino (1990) *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (selections)
- Week 14 04/26 Elliott (2018) "Addressing Industry-Funded Research with Criteria for Objectivity"
John (2019) "Expertise in climate science"
- 05/03 Reading Week
05/10 **Argument Stress Test #2 due!**